

Application No.: 10/030,803

Filing Date: April 9, 2002

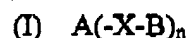
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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A compound of the formula I or II



in which

- A is a hydrophilic, nonionic, linear or branched polymer with a molecular weight of from 100 to 10 000 000 g/mol;
- B is a linear or branched polyethyleneimine (PEI) with a molecular weight of from 100 to 1 000 000 g/mol;
- X is a direct linkage of blocks A and B or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:
 - OC(O)NH(CH₂)_oNHC(O)- with o = 1 to 20,
 - OC(O)NH(aryl)NHC(O)- with aryl = aromatic unit,
 - O(CH₂)_pC(O)- with p = 1 to 10,
 - OCH₂CH(OH)CH₂-
 - OC(O)-, or
 - O(CH₂)_q- with q = 1 to 20;
- n is an integer from 1 to 200;
- [[C]] ~~is a linear or branched PEI with a molecular weight of from 100 to 1 000 000 g/mol~~[[;]]
- D is a residue of a polyethylene glycol of the formula
 - (CH₂CH₂O)_n-R¹

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which is bonded via O and in which n' is from 3 to 25 000, and R^1 is hydrogen, an aliphatic radical or another OH-protective group or a cellular ligand;

Y is a direct linkage of blocks $[[C]]$ B and D or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:

$-C(O)NH(CH_2)_oNHC(O)O-$ with $o = 1$ to 20,

$-C(O)NH(aryl)NHC(O)O-$ with aryl = aromatic unit,

$-(CH_2)_tC(O)O-$ with $t = 2$ to 10,

$-CH_2CH(OH)CH_2O-$, or

$-(CH_2)_uO-$ with $u = 1$ to 20,

and

~~m is an integer from 1 to 200~~ $[[,]]$

with the proviso that the radicals and variables in formula II are defined so that no compounds of the formula I are included thereby.

2. (Currently Amended) A compound as claimed in claim 1, in which

A is a hydrophilic, nonionic, linear or branched polymer with a molecular weight of from 1000 to 100 000 g/mol;

B is a linear or branched polyethyleneimine (PEI) with a molecular weight of from 400 to 100 000 g/mol;

X is a direct linkage of blocks A and B or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:

$-OC(O)NH(CH_2)_oNHC(O)-$ with $o = 2$ to 10,

$-OC(O)NH(aryl)NHC(O)-$ with aryl = aromatic unit with one nucleus,

$-O(CH_2)_pC(O)-$ with $p = 1$ to 3,

$-OCH_2CH(OH)CH_2-$,

$-OC(O)-$, or

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- $-\text{O}(\text{CH}_2)_q-$ with $q = 1$ to 6 ,
- n is an integer from 1 to 50 ,
- ~~[[C]] is a linear or branched PEI with a molecular weight of from 400 to 100 000 g/mol[[.]]~~
- D is a residue of a polyethylene glycol of the formula $-(\text{CH}_2\text{CH}_2\text{O})_{n'}-\text{R}^1$ which is bonded via O and in which n' is from 10 to 5000 , and R^1 is hydrogen, an aliphatic radical or another OH -protective group or a cellular ligand;
- Y is a direct linkage of blocks ~~[[C]]~~ B and D or a linker with the following structures whose C -terminal side is linked to a nitrogen atom of the PEI:
- $-\text{C}(\text{O})\text{NH}(\text{CH}_2)_q\text{NHC}(\text{O})\text{O}-$ with $q = 2$ to 10 ,
- $-\text{C}(\text{O})\text{NH}(\text{aryl})\text{NHC}(\text{O})\text{O}-$ with aryl = aromatic unit with one nucleus,
- $-(\text{CH}_2)_t\text{C}(\text{O})\text{O}-$ with $t = 2$ to 3 ,
- $-\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{O}-$, or
- $-(\text{CH}_2)_u\text{O}-$ with $u = 1$ to 6 ;

and

- ~~m is an integer from 1 to 100[[.]]~~
- with the proviso that the radicals and variables in formula II are defined so that no compounds of the formula I are included thereby.

3. (Currently Amended) A compound as claimed in claim 1, in which

A is a hydrophilic, nonionic, linear or branched polymer with a molecular weight of from 5000 to $50\,000$ g/mol;

B is a linear or branched polyethyleneimine (PEI) with a molecular weight of from 400 to $50\,000$ g/mol;

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X is a direct linkage of blocks A and B or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:

-OC(O)NH(CH₂)_oNHC(O)- with o = 4 to 6,

-OC(O)NH(aryl)NHC(O)- with aryl = tolyl,

-O(CH₂)_pC(O)- with p = 1,

-OCH₂CH(OH)CH₂-,

-OC(O)-, or

-O(CH₂)_q- with q = 1 to 3;

n is an integer from 1 to 12;

[[C]] ~~is a linear or branched PEI with a molecular weight of from 400 to 50,000 g/mol~~ [[:]]

D is a residue of a polyethylene glycol of the formula

-(CH₂CH₂O)_{n'}-R¹

which is bonded via O and in which n' is from 10 to 1000, and R¹ is hydrogen, an aliphatic radical or another OH-protective group or a cellular ligand;

Y is a direct linkage of blocks [[C]] B and D or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:

~~-C(O)NH(CH₂)_oNHC(O)O- with o = 4 to 6,~~

~~-C(O)NH(aryl)NHC(O)O- with aryl = tolyl,~~

~~-(CH₂)_tC(O)O- with t = 2,~~

~~-CH₂CH(OH)CH₂O-, or~~

~~-(CH₂)_uO- with u = 1 to 3;~~

and

~~m is an integer from 1 to 50~~ [[,]]

with the proviso that the radicals and variables in formula II are defined so that no compounds of the formula I are included thereby.

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4. (Original) A compound as claimed in claim 1, which has formula I.
5. (Original) A compound as claimed in claim 1, which has formula II.
6. (Original) A compound as claimed in claim 1, in which X is a linker of the formula $-\text{OC}(\text{O})\text{NH}(\text{CH}_2)_o\text{NHC}(\text{O})-$.
7. (Currently Amended) The method of complexation of polynucleic acids in aqueous systems which comprises contacting a compound of the formula II in which Y is a linker of the formula $-\text{C}(\text{O})\text{NH}(\text{CH}_2)_{[[s]]}\text{NHC}(\text{O})\text{O}-$ with $[[s]]$ $o = 1-10$, and the other radicals are as defined in claim 1 with a polynucleic acid.
8. (Currently Amended) A process for preparing a compound of the formula I as claimed in claim 1, which comprises
 - a) reacting compounds of the general formula V
(V) $\text{A}-(\text{OH})_n$ with A and $n =$ as in formula I
with diisocyanate and reacting the compound resulting therefrom with polyethyleneimine
 - or
 - b) adding compounds of the general formula VI
(VI) $\text{A}-(\text{NH}_2)_n$ (with A and $n =$ as defined in formula I)
to the reaction mixture for the polymerization of ethyleneimine before the start of the polymerization or not until the polymerization is in progress, or
 - c) employing compounds of the general formula VII

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(VII) $A-(OS(O)_2R^4)_n$ with A as in formula I and R^4 = aliphatic or aromatic radical as macroinitiator for the polymerization of ethyleneimine.

9. (Currently Amended) A process for preparing compounds of the formula II as claimed in claim 1, which comprises initially reacting compounds of the general formula IX

(IX) D-OH (with D as defined in formula II)

with diisocyanate and subsequently reacting the resulting compound with linear or branched polyethyleneimine.

~~(VIII)~~

10. (Currently Amended) The method of complexation of polynucleic acids in aqueous systems which comprises contacting a compound of the formula I or II

(I) $A(-X-B)_n$ (II) $[[C]] B(-Y-D)_m$

in which

- A is a hydrophilic, nonionic, linear or branched polymer with a molecular weight of from 100 to 10 000 000 g/mol;
- B is a linear or branched polyethyleneimine (PEI) with a molecular weight of from 100 to 1 000 000 g/mol;
- X is a direct linkage of blocks A and B or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:
 - OC(O)NH(CH₂)_oNHC(O)- with o = 1 to 20,
 - OC(O)NH(aryl)NHC(O)- with aryl = aromatic unit,

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$-\text{O}(\text{CH}_2)_p\text{C}(\text{O})-$ with $p = 1$ to 10 ,

$-\text{OCH}_2\text{CH}(\text{OH})\text{CH}_2-$

$-\text{OC}(\text{O})-$, or

$-\text{O}(\text{CH}_2)_q-$ with $q = 1$ to 20 ;

n is an integer from 1 to 200 ;

$[[C]]$ is a linear or branched PEI with a molecular weight of from 100 to 1
 ~~$000\,000$ g/mol~~ $[[;]]$

D is a residue of a polyethylene glycol of the formula

$-(\text{CH}_2\text{CH}_2\text{O})_{n'}-\text{R}^1$

which is bonded via O and in which n' is from 3 to $25\,000$, and R^1 is hydrogen, an aliphatic radical or another OH -protective group or a cellular ligand;

Y is a direct linkage of blocks $[[C]]$, B and D or a linker with the following structures whose C-terminal is linked to a nitrogen atom of the PEI:

$-\text{C}(\text{O})\text{NH}(\text{CH}_2)_{[[s]]}\text{NHC}(\text{O})\text{O}-$ with $[[s]]$ $q = 1$ to 20 ,

$-\text{C}(\text{O})\text{NH}(\text{aryl})\text{NHC}(\text{O})\text{O}-$ with aryl = aromatic unit,

$-(\text{CH}_2)_t\text{C}(\text{O})\text{O}-$ with $t = 2$ to 10 ,

$-\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{O}-$, or

$-(\text{CH}_2)_u\text{O}-$ with $u = 1$ to 20 ,

and

~~m~~ is an integer from 1 to 200 $[[;]]$

with the proviso that the radicals and variables in formula II are defined so that no compounds of the formula I are included thereby with a polynucleic acid.

11. (Currently Amended) The method as claimed in claim 10, wherein a compound of the formula I or II, in which

A is a hydrophilic, nonionic, linear or branched polymer with a molecular weight of from 1000 to $100\,000$ g/mol;

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- B** is a linear or branched polyethyleneimine (PEI) with a molecular weight of from 400 to 100 000 g/mol;
- X** is a direct linkage of blocks A and B or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:
- OC(O)NH(CH₂)_oNHC(O)- with o = 2 to 10,
 - OC(O)NH(aryl)NHC(O)- with aryl = aromatic unit with one nucleus,
 - O(CH₂)_pC(O)- with p = 1 to 3,
 - OCH₂CH(OH)CH₂-,
 - OC(O)-, or
 - O(CH₂)_q- with q = 1 to 6,
- n** is an integer from 1 to 50,
- ~~[[C]] is a linear or branched PEI with a molecular weight of from 400 to 100 000 g/mol [[:]]~~
- D** is a residue of a polyethylene glycol of the formula
- $$-(\text{CH}_2\text{CH}_2\text{O})_{n'}-\text{R}^1$$
- which is bonded via O and in which n' is from 10 to 5000, and R¹ is hydrogen, an aliphatic radical or another OH-protective group or a cellular ligand;
- Y** is a direct linkage of blocks ~~[[C]]~~ **B** and D or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:
- C(O)NH(CH₂)_{[[s]]}NHC(O)O- with [[s]] o = 2 to 10,
 - C(O)NH(aryl)NHC(O)O- with aryl = aromatic unit with one nucleus,
 - (CH₂)_tC(O)O- with t = 2 to 3,
 - CH₂CH(OH)CH₂O-, or
 - (CH₂)_uO- with u = 1 to 6;
- and
- m** ~~is an integer from 1 to 100 [[:]]~~
- with the proviso that the radicals and variables in formula II are defined so that no compounds of the formula I are included thereby, is used.

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12. (Currently Amended) The method as claimed in claim 10, wherein a compound of the formula I or II, in which

- A is a hydrophilic, nonionic, linear or branched polymer with a molecular weight of from 5000 to 50 000 g/mol;
- B is a linear or branched polyethylenimine (PEI) with a molecular weight of from 400 to 50 000 g/mol;
- X is a direct linkage of blocks A and B or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:
- OC(O)NH(CH₂)_oNHC(O)- with o = 4 to 6,
 - OC(O)NH(aryl)NHC(O)- with aryl = tolyl,
 - O(CH₂)_pC(O)- with p = 1,
 - OCH₂CH(OH)CH₂-,
 - OC(O)-, or
 - O(CH₂)_q with q = 1 to 3;
- n is an integer from 1 to 12;
- [[C]] ~~is a linear or branched PEI with a molecular weight of from 400 to 50 000 g/mol~~ [[:]]
- D is a residue of a polyethylene glycol of the formula
- $$-(\text{CH}_2\text{CH}_2\text{O})_{n'}-\text{R}^1$$
- which is bonded via O and in which n' is from 10 to 1000, and R¹ is hydrogen, an aliphatic radical or another OH-protective group or a cellular ligand;
- Y is a direct linkage of blocks [[C]] B and D or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:
- C(O)NH(CH₂)_{[[s]]}NHC(O)O- with [[s]] o = 4 to 6,
 - C(O)NH(aryl)NHC(O)O- with aryl = tolyl,
 - (CH₂)_tC(O)O- with t = 2,

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$-\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{O}-$, or

$-(\text{CH}_2)_u\text{O}-$ with $u = 1$ to 3 ;

and

~~m~~ is an integer from 1 to 50[[,]]

with the proviso that the radicals and variables in formula II are defined so that no compounds of the formula I are included thereby, is used.

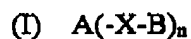
13. (Original) The method of claim 10, wherein the polynucleic acid is DNA.

14. (Original) The method of claim 10, wherein the polynucleic acid is RNA.

15. (Original) The method of claim 12, wherein the polynucleic acid is a ribozyme.

16. (Original) A composition which comprises at least one nucleic acid and one compound of the formula I or II which is as defined in claim 7.

17. (New) A compound of the formula (I)



in which

- A is a hydrophilic, nonionic, linear or branched polymer with a molecular weight of from 100 to 10 000 000 g/mol;
- B is a linear or branched polyethyleneimine (PEI) with a molecular weight of from 100 to 1 000 000 g/mol;
- X is a direct linkage of blocks A and B or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:

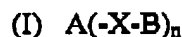
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- OC(O)NH(CH₂)_oNHC(O)- with o = 1 to 20,
- OC(O)NH(aryl)NHC(O)- with aryl = aromatic unit,
- O(CH₂)_pC(O)- with p = 1 to 10,
- OCH₂CH(OH)CH₂-
- OC(O)-, or
- O(CH₂)_q- with q = 1 to 20;
- n is an integer from 1 to 200.

18. (New) The method of complexation of DNA in aqueous systems which comprises contacting a compound of the formula I



in which

- A is a hydrophilic, nonionic, linear or branched polymer with a molecular weight of from 100 to 10 000 000 g/mol;
 - B is a linear or branched polyethyleneimine (PEI) with a molecular weight of from 100 to 1 000 000 g/mol;
 - X is a direct linkage of blocks A and B or a linker with the following structures whose C-terminal side is linked to a nitrogen atom of the PEI:
 - OC(O)NH(CH₂)_oNHC(O)- with o = 1 to 20,
 - OC(O)NH(aryl)NHC(O)- with aryl = aromatic unit,
 - O(CH₂)_pC(O)- with p = 1 to 10,
 - OCH₂CH(OH)CH₂-
 - OC(O)-, or
 - O(CH₂)_q- with q = 1 to 20;
 - n is an integer from 1 to 200;
- with DNA.